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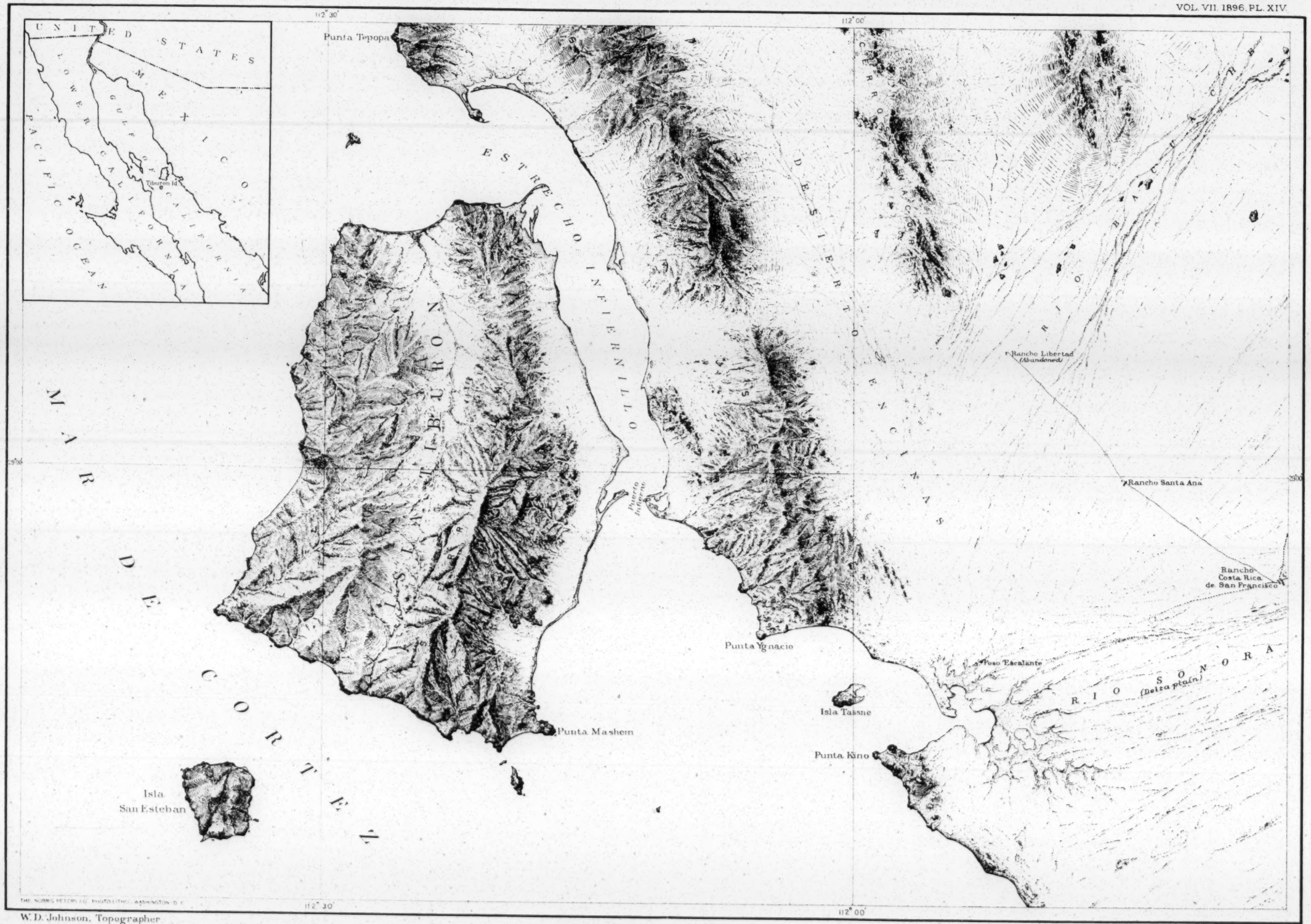

W. D. Johnson, Topographer

W. J. McGee, Ethnologist in Charge

SERILAND

SONORA, MEXICO

From surveys Bureau American Ethnology Expedition, 1895

(Coast-line mainly from U.S. Hydrographic Surveys)

Scale: 7 miles to 1 inch

THE

National Geographic Magazine

VOL. VII APRIL, 1896 No. 4

SERILAND

By W J McGEE and WILLARD D. JOHNSON

After three weeks of seasoning in the saddle, we pushed through the water-gap trenching the chief range of central Sonora and descended the sand-wash (commonly dry, locally wet) for a hard day to the adobe hamlet of Bacuache, and next morning one of us climbed a near-by butte to make a planetable station and incidentally to realize the peculiar isolation of the long-promised land of the Seri Indians, still fifty miles away. On the same afternoon of November 29, 1895, we left sand-wash for butte-dotted plain in time to see the setting sun shadow a jagged mountain crest far out on the broad barrier desert; and the grim fatherland of a fierce tribe, the terror of explorers since Coronado, the dread of Sonora today, the nightmare of the few local settlers, the cynosure of all eyes of the party, was spontaneously, and so unconsciously that no one could remember the sponsor, christened Seriland. Later, in traversing the hard desert and climbing the rugged Sierra Seri, and about the guarded camp fire on Isla Tiburon, alternative names for the territory were sought and temporarily used, but they soon slipped away, while the simple appellation clung.

So Seriland was named, and for present purposes, at least, the informal christening may be made formal.

The little party of the Bureau of American Ethnology pushed on from Bacuache, making stations by the way, to Rancho San Francisco de Costa Rica, where they were met by the owner, Señor Pascual Encinas, the now aged but always intrepid Seri

fighter, with his good wife Doña Anita. There a small party was organized and a little boat was built, and the surveys were pushed into and eventually over the barrier desert and harsh mountains of Seriland, both continental and insular. The story of the work is not without interest, but must be left for other pages.

The instrumental outfit comprised a planetable with compass and alidade, but no means of hypsometric determination. The planetable triangulation was carried from the international boundary, and the scale is fixed by the boundary work in conjunction with the coastwise positions determined by the United States Hydrographic surveys of the *Narragansett* in 1873–'75. From Tiburon the survey was carried eastward beyond Hermosillo, and from this line the surveyed zone contracts somewhat northward to the boundary. The area covered is about 10,000 square miles; 47 stations were occupied for control, and a considerably larger number of additional points for sketching. The accompanying map of Seriland represents only the extreme southwestern portion of the area surveyed; within it 16 stations (including the culminating point in Sierra Seri) were occupied for control as well as for sketching. It should be noted that both control and sketching are hardly what might be desired on the western slopes of Tiburon island.

The district including Seriland may be likened unto a great roof-slope stretching from a lofty comb in the Sierra Madre to and under the gulf of California as into a huge eaves-trough; but the slope is diversified and the eaves-line interrupted by outlying ranges and buttes. The most aberrant part of roof-slope and eaves-line is Seriland; for here the outlying ranges are of exceptional magnitude and rise even beyond the general coastline to form the largest island in the gulf. In general the outline of the coast would not be greatly changed, but only shifted somewhat inland or offward, if the sloping plain of Sonora were to sink or rise a few hundred feet; but if Seriland were lifted only a hundred feet its strait would be drained and Tiburon island would join the continent, while if it were depressed two or three hundred feet the entire province would become two great islands, and even if Sonora were sunk 3,000 feet or more Seriland would persist as an archipelago far in the offing. Thus the land of the Seri stands forth conspicuously on the broad continental slope by reason of exceptional altitude.

Most of the vapor of the Pacific floats over the sun-parched plains and lower mountains along the coast and rolls far up the

slope toward the Sierra Madre before it is condensed, and thus the region is arid. Streams rise in the high Sierra indeed, especially during the midwinter and midsummer rainy seasons, and rush down the strong slope toward the gulf in roaring torrents; but so dry are air and sand that even the largest floods are absorbed well up the incline—and between mountain-born Colorado and sierra-fed Yaki, 500 miles apart, no river ever reaches the sea. The precipitation is greater on the outlying ranges, especially the lofty masses of Seriland, than over the intervening plains; yet everywhere the rainfall is so slight that the region is semidesert, with broad belts of Saharan sands between the coastward ranges. The local configuration about Seriland appears to favor local winds (rising into nearly continuous gales during December, 1895), and the unstable air brings forth fogs which feed the flora of coast and foothills; but little moisture in rain, dew, or fog ever reaches that broadest of the desert plains of western Sonora, the natural boundary of Seriland, Desierto Encinas. So the aboriginal principality of Seriland is set apart, isolated, practically insulated so far as life is concerned, by a natural barrier. It is to this natural isolation, as well as to the ferocity of the natives, that the checking of exploration and evangelization at the Seri frontier is to be ascribed; yet at the same time the characteristics of the savages are in a measure due to their isolation (as shown elsewhere), and thus natural condition and artificial custom have coöperated cumulatively through the centuries to prevent earlier study of the stanch little dominion of the Seri.

The topography of Seriland is striking by reason of the ruggedness of the ranges which rise steeply from great apron-like expanses of foot-slope or plain. The abrupt transition from jagged cliffs above to smooth plains below conveys irresistibly the impression that the mountains are buried to their ears in vast torrential deposits which line the intervening valleys to profound depths; and the geologist is surprised and distrustful of observation until many times repeated when he finds that the intermontane expanses are simply planed rock strata with a scant veneer of torrent-spread alluvium. This topographic paradox, of which the whole of Seriland and much of adjacent Papagueria form a great example, is well illustrated in a section exposed in the shore between Puerta Infierno and Punta Ygnacio. A quarter of this 15-mile exposure is the current-built point, another quarter cuts butte or range of igneous rock or ancient granite, while the remaining half traverses typical intermontane plain in cliffs of 20 to 50

feet, and fully 5 out of the 7½ miles of the low cliff reveal the substratum of planed granite beneath a torrential veneer, while there is more of alluvium-free granite than of graniteless alluvium. The sharp contrast between mountain and plain is doubtless due to the character of the scant rainfall; but the relation need not be further pursued at present. Hardly less striking than this general topographic relation are the strong local features of the topography. Tiburon island is but 30 miles long and less than 20 wide, yet it contains several ranges, the dominant one (Sierra Kunkaak) of Alpine ruggedness throughout most of its 4,000 feet of altitude. Sierra Seri is an imposing assemblage of peaks, aretes, precipices, and profound gorges, cutting the azure at fully 5,000 feet, though the width of the range from strait to desert is but 10 miles. Even more impressive than the mountains, to the explorer on the ground, is Desierto Encinas—the broad waste of playas and sand dunes lying over against the Papago of old, the law-bound Sonora of today. Toward its broad basin-shape expanse storm freshets flow apparently from all directions, yet it is never filled and rarely wetted, and the scant water sometimes rising to the surface on its steeper western slope is saline; it is partly barred from the gulf and lined in its lower levels by a sheet of sediment charged with recent marine shells, which show that at no remote day it was an arm of the sea. Of interest, too, is the gale-swept strait El Infiernillo, for the foot-slopes on island and mainland are just such as sweep down and merge between the parallel ranges of the interior, and extend nearly or quite to the coastline where they are cut by wave-carved cliffs or pass into current-built sand-spits, making it manifest that the strait was originally a subaerial valley like those of the interior and only recently occupied and slightly modified by the sea. Isla Tassne, too, is a noteworthy feature; though but a fraction of a mile in any dimension and for the most part a wave-built bench, its nucleus is a 500-foot spire of rock, the half-submerged crest of a twinned peak on which myriads of water fowl nest. The topographic detail of Seriland is that of water-carving or water-building, yet the aridity is such that the work must proceed at infinitesimal rate. The dearth of water is a burning question to the explorer, a vital element in prospective conquest of Seriland for the behoof of civilized man. In all the half dozen valleys, the hundred barrancas, and the thousand storm-cut gorges, there are probably less than a dozen nominally permanent, and but two or three actually permanent, sources of fresh water in the territory.

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VIEW OF SERILAND

Camp at Seri Rancheria on Tiberon Island. Location, base of sand-spit looking eastward over Puerta Infierno toward southern part of Sierra Seri. Expedition boat *Anita* at anchor.

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The geology of Seriland is worthy of study. The prevailing rocks of the principal ranges are rather ancient (probably Mesozoic or early Tertiary) lava sheets with associated tuffs and breccias, while in several localities, notably the western foot-slopes of Sierra Seri, there are large areas of still more ancient granite, often slightly schistose and intersected with dikes and veins. It is the current belief in Sonora (a belief based partly on the use of rare minerals as face-paint among the Seri) that rich deposits of ores and precious metals exist in Seriland, and certain portions of the area examined certainly appear worth prospecting; but no rich deposits were found, and most of the rocks examined are unpromising. The dominant geologic feature of the territory is that reflected in the topography—the abrupt transition from rugged mountain to smooth peneplain of similar rocks with a veneer of fragmental debris. Generally this debris is unconsolidated and fresh-looking, though sometimes it is cemented by siliceous or ferruginous matter, and toward the eastern side of Desierto Encinas even the superficial portions of the alluvium are somewhat indurated, as if by calcareous infiltration, into a mass known as caliche in western Mexico (the tepitate of eastern Mexico). No deposits postdating the extravasation of the lavas and the outlining of the mountain ranges were seen save the shell-charged sands of Encinas desert; these deposits and the shelf skirting Tassne island on north and east suggest relatively recent uplifting, while the configuration of shores, especially in Estrecho Infiernillo, demonstrates relatively recent subsidence, so that to one of us, at least, the combined records indicate local warping. To some extent in Seriland, as decidedly in contiguous Papagueria, the divides are migrating northeastwardly, and this widespread characteristic suggests a relatively recent tilting of the land southwestward, whereby the feeble streams flowing with the increasing slope are stimulated while those flowing against it are paralyzed.

The meager flora of Seriland is peculiar. The conspicuous forms are cacti, comprising the monstrous saguesa (a *Cereus* related to *giganteus* but still larger) and wide-branching pitahaya (*Cereus thurberi*) on the foot-slopes, with the cina (*Cereus schottii*) and cholla (a cylindropuntia) at lower levels and the water-bearing bisnaga (*Echinocactus*) here and there on the mainland, though few and far between on the island. The ghostly okatillo (*Fouquiera splendens*) is fairly abundant, and there are occasional yuccas and a variety of the more slender agaves. The

prevailing trees, which are usually little more than shrubs, are mesquite, catclaw (*Acacia greggii*), and paloverde (*Parkinsonia microphylla*) on plain and foothill, and paloblanca, torote, and torotito among the mountains; the prevailing shrub is the creosote bush (*Larrea tridentata*), with a variety of small mimosas and other brambles, all scrubby and all beset with thorns or endowed with foul flavors and odors; and about the few permanent waters there are patches of bamboo-like reeds, which are used by the Seri in making balsas and sometimes in building bowers for habitation. It is not too much to say that there is no soil in Seriland, for the scant moisture and slow-growing plants do not produce humus; and the gray or ashen earth between the scattered plant-colonies glares starkly in the glowing sunlight, inflaming the eyes of the traveler as in snow-blindness. Two general features of the vegetal life of the region may be noted: Partly by reason of the absence of humus, the superficial deposits are comminuted mechanically but imperfectly reduced chemically, so that they vary from place to place with the variation in rocks and quantity of water, and thereby tend to produce local floras, or a provincial habit of the general flora; while it results from the dearth of water and strength of sun that the plants strive against the inorganic environment rather than against each other for continued existence, and are thereby brought into a curious coöperation, whereby nearly all plants (and animate organisms as well) gather into colonies for mutual support. These relations, though highly significant and attractive, need not be pursued here; it suffices to say that they profoundly affect the flora which, as even a casual traveler cannot fail to note, varies notably from place to place, and is generally gathered in close-set tufts or bunches, with broad bare spaces between. The flora on island and mainland is essentially the same; and the coasts, insular and continental, are skirted with a zone of pulpy-leaved shrubs and bushes apparently watered by fogs.

The fauna of Seriland includes the bighorn and bura (a large, sluggish deer) in the mountains, the antelope, peccary, and blacktail deer on the plains, with the jackrabbit and coyote everywhere; the jaguar is reputed common and the puma rarer—the assemblage of large game animals being rich enough to tempt the sportsman. The turkey is said to haunt the saguesa forests and the California quail may be seen hourly, and small birds are surprisingly numerous, while hawks, eagles, and burrowing owls

abound. The rattlesnake, scorpion, centipede, and tarantula furnish spice for the fare of the traveler, while rainbow-hued swifts and somber, slow-moving lizards of alleged poisonous bite harbor numerously in the scattered plant colonies. Ground-squirrels and kangaroo-rats are common. On some portions of the island the squirrels abound exceedingly, so that the land is laid out in hexagons by their surface trails, while each third or fifth footfall of the pedestrian stops half knee-deep in subsurface burrows. There are ants galore, and myriads of black bugs that apparently fertilize the cacti, but mosquitoes, gnats, and other pernicious insects are apparently unknown. The coöperation of the vegetation extends unto the animate life of plain and mountain to the extent that all living things dwell together in singularly perfect harmony; but this feature of the life may be passed over. Along the coast the green turtle abounds and forms the chief fare of the Indians, and his shells shingle the more permanent house-bowers. Fish and crustaceans swarm, edible crabs and oysters and superb lobsters await gathering, and clams sprinkle the coastwise mud flats. The gray pelican breeds on Isla Tassne—the first-formed land of earth as built by the Ancient of Pelicans, in Seri myth,—and his flesh feeds, while his feathered skins clothe, the ever-warring holders of Seriland; and other water-fowl, from swan to snipe and from cormorant to curlew, chatter and scream and croak about the rocky islets and spurs, especially on the fowls' paradise of Isla Tassne. The seal creeps up on the rocks now and then, the shark scavengers the sea as the coyote the land, and the skeleton of a whale fully 80 feet long on the shores of Tiburon records a famous feast of the Seri when for weeks they found no need for hunting and fishing and for months gnawed gradually softening tendon and cartilage. The subdesert fauna of Seriland is meager and peculiar, but the maritime fauna of the coasts is rich and varied.

The fierce holders of desert-bound Seriland have protected their inheritance from time immemorial, and since the time of Coronado have written their history in blood. Three of their many interesting characteristics are especially notable: They are isolated in language, belief, custom, and sympathy as in habitat; they are dominated by a moral law under which intermarriage with other peoples is capital crime and under which they attain righteousness by slaying humans of alien blood with only greater avidity than beasts are slain, always save when deterred by fear; and they are of a stature, strength, and endurance befitting their hard and eventful lives.

The coast of Seriland has been surveyed, and long ago a pearl fishery was maintained for a time on its borders near Punta Tepopa. There is a tradition that Sergeant Escalante (he who later swam the Gila and saw Casa Grande) wandered into the bounding desert in the seventeenth century, and dug a shallow well which still yields a yellow nitrous water and is known sometimes as Poso Escalante, sometimes as Agua Amarillo; and there are vague rumors of prospectors and other parties landing on island and mainland, but soon retreating with loss of life from poisoned arrow or still more poignant thirst. It is known, too, from living witnesses that Sr Pascual Encinas pushed stock-raising well toward the desert and sometimes even across it to the saline waters at the eastern base of Sierra Seri, the Indians contenting themselves with a heavy impost of surreptitiously slaughtered stock, and that he twice or oftener visited Tiburon, once with a small party for a few hours, once with a larger party, including horses transported by a steam vessel, for two or three days; but until 1895 (when Encinas' trustiest assistants were added to our party and taken far beyond their previous knowledge) the interior, continental and insular, was never surveyed, most of it never seen by white men.

The previously published nomenclature is adopted so far as it goes, together with a part of the unpublished field nomenclature of the Hydrographic Office, save for a few trifling exceptions mostly made with the object of expressing the generic elements in the language of Mexico (articles being omitted for brevity). So far as practicable the specific elements, especially on the insular tract, are Seri, the accents being indicated here but not on the map. It has been sought to use names originally connotive yet of such character as readily to become denotive, due regard being given to euphony and brevity—qualities not easily found among the simple-minded savages. The names applied are as follows, those marked by asterisks being new and those marked by obelisks being recast:

* Seriland: Extra-vernacular name of tribe with English locative.

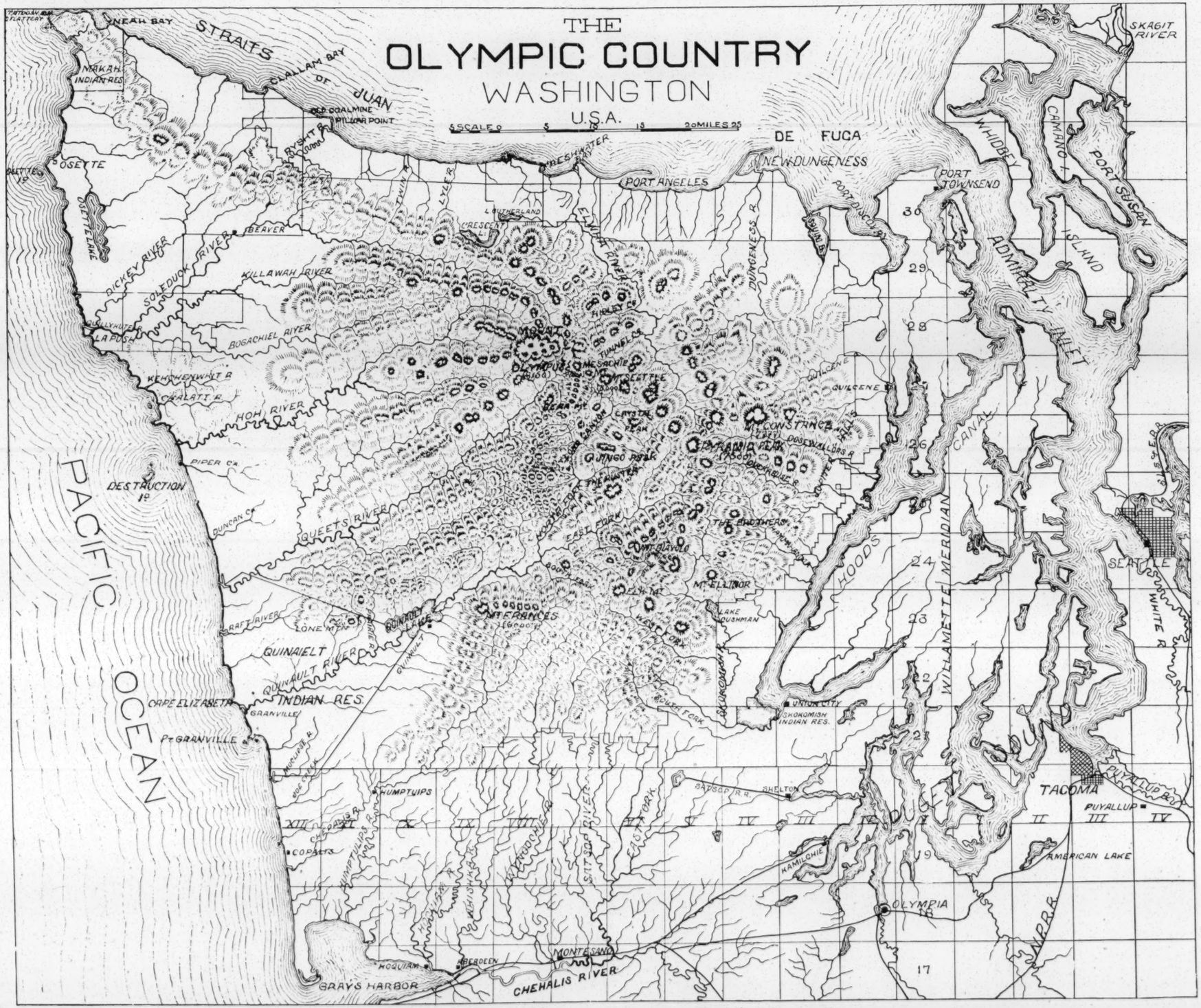
Mar de Cortez (Sea of Cortez = Gulf of California): Customary Spanish designation.

† Isla Tiburon (Shark island): Spanish.

† Isla San Esteban (Saint Stephen island): Spanish.

† Isla Tass'ne (Pelican island): Specific Seri (sometimes called Alcatraz = Pelican in Spanish).

Estrecho [or El] Infiernillo (Hellish strait): Spanish.



THE TOPOGRAPHY OF THE MOUNTAINOUS REGION OCCUPYING THE CENTRAL PORTION OF THIS MAP IS BASED ON THE EXPLORATIONS OF MR S. C. GILMAN, C. E., WHOSE ARTICLE, "THE OLYMPIC COUNTRY," APPEARS IN THIS NUMBER.

† Puerta Infierno (Infernal gate): Spanish.

† Punta Tepopa (Tepopa point): Generic Spanish, specific of long standing.

* Punta Ygnacio (Ygnacio point): Specific in honor of Ygnacio Lozania, a trusty aid who had previously visited this point.

* Punta Mashem′ (Mashem′ point): Specific in honor of sub-chief Mashem′ (sometimes called Francisco Estorga), who speaks Spanish and acted as interpreter in 1894.

† Punta Kĭno (Kino point): Specific (of long standing) in honor of the early missionary.

* Sierra Seri (Seri range): Generic Spanish, specific the extra-vernacular tribe name.

* Sierra Kunkaak′ (Kunkaak′ range): Specific the vernacular tribe name.

* Cerros Anacoreta (Anchorite hills): Spanish.

* Disierto Encinas (Encinas desert): Generic Spanish, specific in honor of the intrepid settler on the outskirts of the desert.

Poso Escalante (Escalante well): Generic Spanish, specific in honor of the early explorer.

Rancho San Francisco de Costa Rica: Spanish (elements transposed on map through error).

Rancho Santa Ana: Spanish.

Rancho Libertad: Spanish (now abandoned).

Rio Sonora: Spanish.

Rio Bacuache.

THE OLYMPIC COUNTRY

By the late S. C. Gilman, C. E.

[The following valuable article is based largely on the explorations of the writer in the comparatively unknown region he describes. A melancholy interest attaches to it, Mr Gilman having been suddenly cut off, at the early age of thirty-six and in the midst of an increasingly useful and promising career, only a few days after the transmission of the article for publication and before he could be made aware of its acceptance.]

The Olympic peninsula, in northwestern Washington, forms the extreme northwest corner of the United States proper. It lies west of Puget sound, Admiralty inlet, and Hood's canal, commonly spoken of collectively as Puget sound, and extends over 90 miles along the south side of the straits of Juan de Fuca. Its west coast borders for 100 miles on the Pacific ocean, while Gray's harbor and the Chehalis river furnish deep-water navigation for 30 miles along its southern border, leaving only a neck of 25 miles in width connecting its southeastern part with the mainland.

As the northern, eastern, and southern sides of the peninsula, bordering on Fuca straits, Puget sound, and the Chehalis river and Gray's harbor, are partially settled and comparatively well known for six to ten miles back from those waters, this article will have reference almost exclusively to the interior and western portions of the peninsula. The whole peninsula contains an area of about 5,700 square miles, of which probably 3,000 square miles are occupied by the Olympic mountains, from which the peninsula takes its name.

The main watershed of these mountains begins at cape Flattery and extends southeasterly almost parallel with the straits and about 12 miles therefrom until nearly south of Port Angeles, where an abrupt turn to the south is made for about 6 miles, passing by the east end of mount Olympus; thence southeast 20 miles to Pyramid peak; thence southwest and gradually swinging to the west for 30 miles to mount Frances at the head of Quinault lake; thence southwest for about 18 miles, rapidly decreasing in height until it reaches its termination. Such is the general course of the divide between the waters flowing westward to the Pacific ocean and those flowing to the north, east, and south into Fuca straits, Puget sound, and Gray's harbor. From the main divide, and in many places exceeding it in height, branch out in all directions spurs and ranges, they in their turn rebranching and branching again, until the complicated ramifications of mountain ridge and peak so completely cover the country with their rugged heights that there is hardly room for the gorges and canyons and ravines that lie between, and none at all for valley or plain. These mountains are a comparatively recent upheaval, and nature has not yet had time to round off their slopes or dull the jagged sharpness of their summits. She has, however, through the agency of an enormous rainfall, cut various gigantic sluices in the rocky face of the mountains, and through these a large amount of detritus is brought down.

Mount Olympus, the name peak, 8,150 feet high, is the highest and most conspicuous mountain in the range. It was first named La Sierra Santa Rosalia, by Perez, in 1774, but in 1788 Captain John Mears saw and described it under the name of mount Olympus. It is about twenty miles south of Freshwater bay on the straits of Fuca, and is southwest of the main divide, with which it connects by a short, sharp, high ridge. It is a cluster of sharp, jagged rock peaks projecting upward through an accumulation of ice which forms a cap two miles wide and four miles

long to the main body of the mountain. It is difficult to estimate the thickness of this ice cap. At the close of summer, when it is thinnest, there are places where it has the appearance of being at least 500 feet thick. It is built up many additional feet in thickness by the storms of winter, to be correspondingly melted away again by the succeeding warm summer months. The Queets, Hoh, and Solduck rivers head in mount Olympus, and Higley and Tunnel creeks, branches of the Elwha, have their sources in an ice-field two miles long and three-fourths of a mile wide close to the northeast end of Olympus. Tunnel creek has formed a beautifully arched tunnel 20 feet high and 40 feet wide (in summer), through which it flows for two and one-half miles under an accumulation of ice that fills the gorge to a depth of 100 to 300 feet. These accumulations of ice are very numerous among the higher peaks all through the range.

As for scenery, perched on one of the numerous accessible peaks you are surrounded by towering, sky-piercing pinnacles and ragged, rocky ice-capped ridges that are plowed and harrowed by slides of rock and ice and chiseled and worn by ages of rushing water, mantled with snow and garlanded with great patches of roses and daisies and dainty mountain flowers and gowned with dense, dark evergreen forests, reaching far down into cavernous depths of canyon and ravine, across which on some opposite mountain side is rushing down from its icy fountain head a tumultuous mountain torrent which finally dashes over a lofty precipice and is lost in a veil of mist in the valley below. Away to the west is seen the ocean with its lazily rolling billows, the dark trail of a steamer's smoke, and the white sails of a ship just showing above the horizon. To the east lie Hood's canal and Puget sound, with their bays and arms and inlets spread out like silver leaf on a carpet of green. Beyond rise the dark, wooded slopes and snow-clad summits of the Cascades, with grand old Rainier standing guard to the southeast and the majestic Baker to the northeast.

Lakes Cushman, Crescent, and Quinault are all of considerable extent and great depth. At Quinault lake, nearly 20 miles from the ocean, the boom of the breakers on the beach is plainly heard during and after a storm, but the sound comes from the opposite direction to the ocean, being reflected from the slopes of mount Frances on the east. For 25 miles north from the mouth of Gray's harbor is a stretch of broad, smooth, hard, sand beach reaching to point Grenville. From point Grenville to cape

Flattery, bluffs 100 to 250 feet high border the ocean. Sometimes they stand a little back, leaving a narrow strip of loose sand, gravel, boulders, or slippery ledge between them and the sea. Sometimes they approach a little closer; the strip of sand or rock is correspondingly narrower and covered with water as the tide rises. Often they push boldly into the sea, which continually surges and dashes at their feet and leaps high up their face. About five miles southwest of the mouth of the Hoh river and four miles offshore is Destruction island, so called on account of the numerous wrecks that have occurred on its reefs and on the adjacent main shore. The island stands among many broad reefs, some of which are just visible at low tide, and over these the ocean swells foam and boil at high tide. It rises abruptly, with precipitous sides, 80 feet above the water, and then spreads out smooth and level about 60 acres in extent. The Hoh Indians have long cultivated several small potato patches on it and have also used it as a lookout station for whale, in the capture of which animal they have attained great proficiency. The United States Government has built on the island a lighthouse of the first order, 80 feet high, with a double fog-horn and the usual auxiliary buildings. It commands a fine view of the coast and mountains.

On the mountains, above 4,000 feet, the timber is very scrubby and infrequent, owing, probably, as much to the barrenness of the soil and the great depth of snowfall as to the elevation. At a lower altitude, among rocky crags, are thousands of acres of the finest grazing lands, well watered by innumerable rivulets and pools, fanned by the winds from the ocean, and free from flies, mosquitoes, and all other annoying insects. Of course, these grasslands would not be habitable during the winter, but they would be available from the first of June until December. Among the rocks at the edge of the grasslands, and just below the ice-fields, blueberries, huckleberries, and bearberries grow in profusion, and the season for them lasts from July to October, as they follow the snow up as it melts away, blossoming just below it and ripening a little lower down. These berries attract thither large numbers of black bear, and it is the exception when none are in sight among the peaks during the berry season. These open grasslands are also favorite ranges for large numbers of the elk that are common all over the peninsula and bands of fifty or more are often seen. From 4,000 feet down, the timber is good and thrifty. The Alaska cedar, from one and one-half to five feet

in diameter and running up smooth and tall, is a very valuable variety of timber and is common down to 1,000 feet above sea level. The mountains and uplands of the peninsula generally are heavily timbered with hemlock, cedar, spruce, fir, balsam, pine, vine-maple, alder, cottonwood, yew, cherry, etc., prevalent in about the order named and of the usual Puget sound size and quality. The valleys and bottom lands are densely covered with alder, vine-maple, cottonwood, willow, boxelder, crab-apple, ash, dogwood, and occasional immense bottom-land spruces. There is frequently also a very heavy undergrowth of sallal or salmon berry or of hazel or of mountain hemlock. It is also a great country for moss, which grows deep on the ground and down timber and on the trunks of standing trees and hangs in long streamers from the twigs and branches, and is always wet and slippery except in the dry season. Many beautiful varieties of small, delicate ferns grow among the forests. On the prairies, which are neither numerous nor large, and which are often gravelly, though sometimes containing a very rich soil, a large and coarse variety of fern grows four to ten feet high.

Between the mountains and the coast are about 1,300 square miles, or 830,000 acres, of comparatively level valley and bench lands. Of this about 225,000 acres are rich bottom lands along the various streams. The soil of these bottom lands cannot be surpassed anywhere on the coast. The uplands are generally rolling, but there are several quite extensive and comparatively level tracts. The fact of these lands not draining readily has encouraged the growth of fine bodies of large cedar, with, in some places, tall, smooth, large, white pines scattered among them. These cedar lands are in no sense swamps or bogs. The soil is a heavy clay, into which the sluggish streams have not cut very deep channels, and they are frequently clogged or turned by fallen timber, so that during the rains the streams overrun their banks and spread pretty much all over the country, keeping the ground well soaked all through the rainy season. There are, however, abundant facilities for drainage. The soil is excellent, and there are numerous small openings sufficiently large for nice farms. The soil of the rolling uplands is generally a rich, shot clay, but sometimes quite gravelly. The timber is generally very heavy and it will be many years before all the good land is under cultivation. There are, however, many open places and small creek bottoms and depressions among the hills that can be very easily cleared. In fact, there are few 160-acre tracts on which

cannot be found ten or more acres of good land comparatively easy to clear, and the timber on all these lands will be valuable in a few years and be a help instead of a hindrance in establishing a home.

The principal streams draining this slope are the Quillyhute and its four branches, the Dickey, the Solduck, the Killawah, and the Bogachiel; the Hoh, Queets, Quinault, and Humptulips. They are all clear, cold, rapid streams, capable of floating logs and being canoed considerable distances. They teem with salmon and trout. The Quinault salmon, peculiar to that stream, is a short, thick fish, weighing from three to seven pounds and said to be the finest variety of salmon on this coast. Opportunities for developing good water-power at very small cost are numerous along these streams, and especially so in the mountains. Game is plentiful, and it would be a paradise for the hunter were it not so difficult of access. In addition to elk and bear, before mentioned, are deer, mountain goat, cougar, beaver, otter, fisher, wildcat, marmot, geese, ducks, grouse, partridge, quail, pelican, and many smaller or less desirable birds and animals. Off the beach from Gray's harbor to point Grenville is one of the few sea-otter ranges of the world. It still furnishes a few hides of that valuable fur to market each year.

The country rocks of the mountains are syenite, gneiss, quartzite, protogene, crystalline and chlorite schists, slate (hard black flinty to soft green talc) shale, sandstone, trap, and basalt. In the foothills on the west and along the coast the formation is principally shales, sandstone, cement gravel, conglomerate (in one place near Hoh Head, boulder conglomerate), clays and drift gravel and sand. Limestone much criss-crossed with small quartz seams is found in a few places. Clays are especially abundant and good-appearing, and, so far as tried, give very excellent analytic returns. Beds of partially formed lignite are abundant along the coast between the Quinault and Quillyhute rivers. In a bluff, a few miles south of the mouth of the Hoh river, four seams of such lignite, from 18 inches to 3 feet thick, show, lying horizontally one above the other, and separated by 4 to 12 feet of sand or clay or both. In this lignite the form of roots, trunks, and limbs of trees, also the grain of the wood, show very distinctly, and occasionally pieces of wood, but little changed, are found. Small seams of very good coal crop out in several places in sandstone and shale, but they are too small, so far as found, to be of any value. Between Pillar point and

XUM

Clallam bay, on the straits of Fuca, is the abandoned Thorndike coal mine. There are said to have been "six leads of coal, ranging in thickness from 1 to 3 feet, dip 10 degrees, distance between coal leads, 12 to 100 feet, formation sandstone." This is said to have been one of the best coals found in Washington. It was mined for some time, until it pinched out or was cut off by a fault and the vein was lost and work abandoned.

In the valley of the Solduck river, among the mountains, is a group of springs which discharge quite a volume of hot water of undetermined medicinal value. Fine springs heavily charged with iron or sulphur are very numerous. On the coast just south of the Queets river, in the bluff along the beach, are several small alum springs. The alum is present in very small quantities, and cannot be detected during the rainy season, when the natural flow of the springs is reinforced by the numerous rains; but during the dry season, when the springs are at their lowest ebb and when the water from them is evaporated very fast as it trickles down the cliffs exposed to the afternoon sun, the alum marks with white streaks the margin of the rivulets. There is also some borax present, and probably other chemicals might be found in measurable quantities.

Several varieties of iron ore are scattered promiscuously over the peninsula in limited quantities, and ocher and iron stains are numerous. Near Port Townsend is a deposit of limonite that has been worked for some time. On the headwaters of the Humptulips river is a vein of magnetite about one foot thick. On the coast south of Raft river is a bed of clay ironstone of very low grade and so badly mixed with sulphurets as in all probability to be worthless. The traces of iron are so abundant and widespread that it would seem that there must be somewhere in the peninsula extensive deposits of a pure and valuable ore.

Colors of gold are found in the beach sands and along several of the streams in the mountains, and in a few places fair wages have been made washing it. Low grade silver and copper ore are found in good-sized veins in the mountains. Comparatively little prospecting has been done, owing to the inaccessibility of the region; not enough to determine its value as a mineral country.

It does not seem reasonable to suppose that the great upheaval of these mountains has been accomplished without bringing within reach some valuable mineral deposits. The principal apparent wealth of the peninsula is in its immense forests of fine

timber, of which the Alaska cedar of the mountains will soon be an important factor, and in the large area of fertile valley and benchland on its western slope.

The climate of the western slope of this peninsula is a little different from that of the rest of western Washington. Owing probably to its proximity to the ocean and its accessibility to the ocean breezes, there is more wind and much less foggy weather. The amount of rainfall on the average is in excess of that of the Sound country, but it comes in the shape of sharper showers and heavier storms, thus allowing a much greater proportion of fair weather. In the summer the nights are cool, but not cold, allowing tomatoes and corn to ripen perfectly and naturally, as they do not elsewhere west of the Cascades. Except in the mountains, ice or snow is seldom seen, and then only for a few hours at a time.

THE DISCOVERY OF GLACIER BAY, ALASKA

By Eliza Ruhamah Scidmore

(*The Century Dictionary*)

"Discover—4. To gain sight of, especially for the first time, or after a period of concealment; espy; as, land was *discovered* on the lee bow.

"Hence 5. To gain the first knowledge of, as something that was before entirely unknown, either to men in general, to the finder, or to persons concerned; as, Columbus *discovered* the new world; Newton *discovered* the law of gravitation; we often *discover* our mistakes when too late, &c.

"6. To explore; bring to light by examination."

(*Webster's International Dictionary, 1892*)

"Discover—2. To disclose; to lay open to view; to make visible; to reveal; to make known; to show (what has been secret, unseen, or unknown).

"3. To obtain for the first time sight or knowledge of, as of a thing existing already, but not perceived or known; to find out; to ascertain; to espy; to detect."

(*The Standard Dictionary*)

"Discover—To get first sight or knowledge of, as something previously unknown or unperceived; find out; ascertain; espy; detect; *specifically*, to find and *bring to the knowledge of the world*; as, to *discover* a comet, a principle, or plot."

"It is in the highest degree probable that Lief Ericsson and his friends made a few voyages to what we now know to have been the coast of America; but it is an abuse of language to say that they '*discovered*' America."

Fiske, "*Discovery of America*," vol. 1, ch. 2, p. 255.

In a recent communication to the Geographical Society of the Pacific, Rear-Admiral L. A. Beardslee has raised questions as to the discovery of Glacier bay, prompted thereto by an article by Professor John Muir, published in the *Century Magazine*, June, 1895. Admiral Beardslee very flatteringly refers to and quotes in proof certain published notes of my own—notes published in such condensed form for general and average tourist information that not all the details and facts relative to the discovery of and earliest visitors to the bay could be given.

Vancouver's description would dispel some of Admiral Beardslee's references to later visitors, since he very plainly noted the fact that there was a navigable bay with an entrance, and wrote:

> "The shores of the continent form two large open bays, which were terminated (July 12, 1794) by compact, solid mountains of ice rising perpendicularly from the water's edge and bounded to the north by a continuation of the united, lofty, frozen mountains that extend eastward from mount Fairweather. In these bays also were great quantities of broken ice, which, having been put in motion by the springing up of a northerly wind, were drifted to the southward."

The Fairweather ice-sheet extended then some 40 miles south of its present limit in the bay. The Russian traders aptly named Icy straits into which the bay debouches, and as there were no Indian villages on its north shore, where currents and floating ice made navigation dangerous, they kept away, and their charts only repeated Vancouver's lines.

The first really known of the existence of this great bay of tide-water glaciers was in 1869, when Kloh-Kutz, the Chilkat chief, told Professor George Davidson of a bay full of breaking ice cliffs lying to the westward of the Davidson glacier in Lynn canal. It was distant only one day's journey on snow-shoes (30 miles), he stated, and Kloh-Kutz urged the astronomer to make the little excursion with him and see the hair-seal riding around on ice cakes and the ice rumbling down like landslides into the water. The visit of ex-Secretary Seward to the eclipse observatory and his waiting to convey Professor Davidson back to Sitka on his private steamer prevented the full discovery of the bay that season by that first and greatest of Pacific coast scientists whose name is so inseparably connected with all of geographic record on that side of our continent.

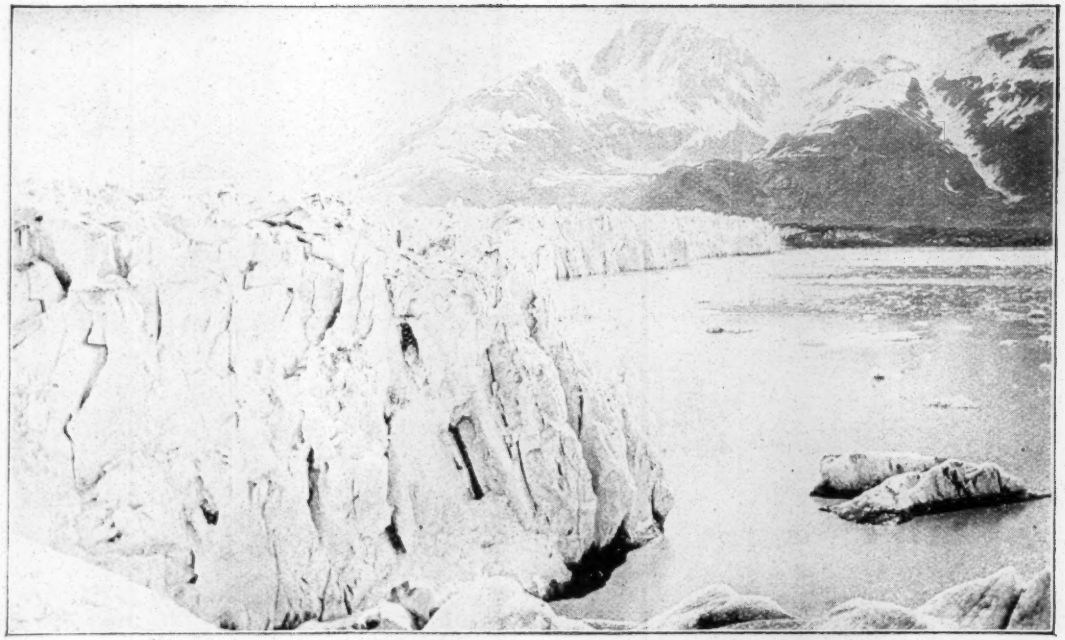
In 1877, when Lieutenant C. E. S. Wood, U. S. A., and Mr Charles Taylor were prevented from making their proposed exploration of the mount St. Elias region by the mutiny of their

native boatmen, the old chief pointed to mount Fairweather and said: "One mountain is as good as another. There, is a very big one. Go, climb that, if you want to." The disappointed explorers were forced to turn back, and then visited the most westerly of Vancouver's great bays south of mount Fairweather, afterward named Taylor bay by Coast Survey officials. In that most interesting and beautifully illustrated article, "Among the Thlinkets," *Century Magazine*, July, 1882, Lieutenant Wood wrote:

"Mr Taylor decided to return home, and we accompanied him to Sitka. There I reëngaged Sam and Myers, and, obtaining a new crew, returned at once to a bay about twenty miles southeast of mount Fairweather. My purpose was to explore the bay, cross the Coast range, and strike the upper waters of Chilkaht."

From that bay he "went with a party of mountain-goat hunters up into the St. Elias Alps back of mount Fairweather—that is, to the northeast of that mountain." He found that great game, also the rare St. Elias silver-tipped bear, crossed the divide to sight of the bush country explored by Mr E. J. Glave in 1891, and returning to the bay spent several days in the seal-hunters' camp in Geikie inlet near the Wood glacier, as they were later named by Professor Reid. Lieutenant Wood had applied for a year's leave of absence, with the intention of making further independent exploration in the interior of Alaska, but it was denied him. His brief reference to the bay in a popular magazine article cannot be accepted as bringing it definitely to the knowledge of the world, since he did not specifically describe, sketch, map, or name any part of the region. In private letters and verbally, whenever the subject has been broached, Lieutenant Wood entirely disclaims being the discoverer of Glacier bay, and very modestly protested against Professor Reid's naming for him the glacier beside which he had camped. It was not vital to him at the time that the bay was not charted; he simply went along with the Hoonahs to the region where they promised great game—not going for glaciers nor glory, but only to shoot mountain goat and see the alpine region behind mount Fairweather.

In October, 1879, Professor John Muir, who for two seasons had been searching for and visiting the glaciers of the Alaska coast from the Stikine river northward, found this bay full of glaciers of which native seal-hunters had told him. He, with his companions, Rev. Hall Young and four Christian Indians from Fort Wrangell, canoed to the head of the bay, camped for a few days,



FRONT OF MUIR GLACIER FROM THE WEST MORAINE — MOUNT CASE IN THE BACKGROUND

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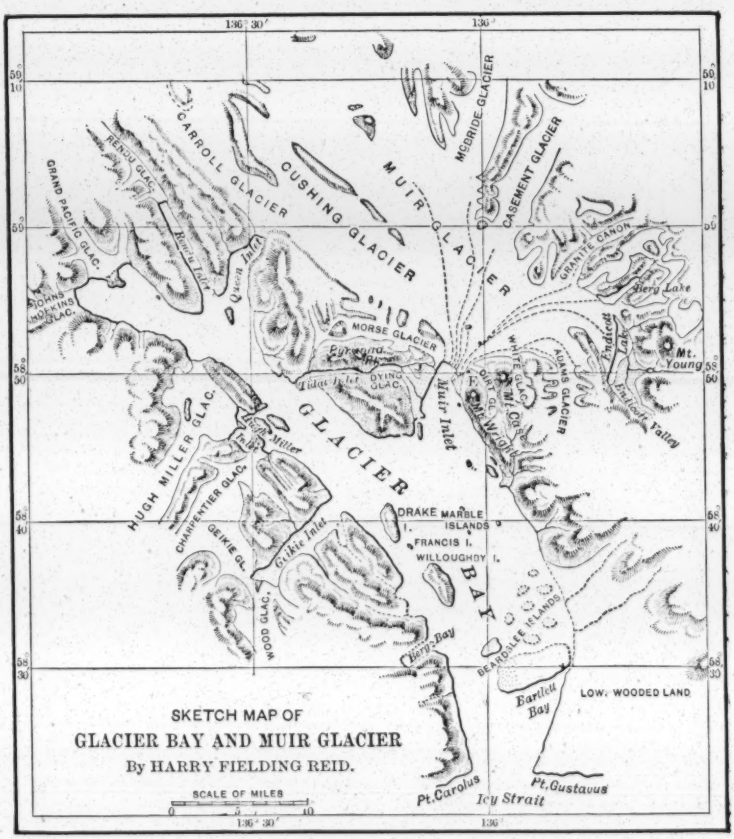
and made the circuit of its shores. Having found these glaciers, he brought them to the knowledge of the world in the series of letters from Alaska published in the San Francisco *Evening Bulletin*, and described them in lectures illustrated by blackboard sketches of these remarkable "Fairweather glaciers."

In July, 1880, Captain Beardslee brought the steamer *Favorite* into the bay, up to that time unknown to the Russian pilot who accompanied him. They proceeded a little beyond the island then named for the trader, Willoughby, who was with them, and then turned back, fleeing from storm-clouds and fog that greatly alarmed the owners of the chartered steamer, who feared the loss of their insurance in the event of any disaster befalling them in those uncharted and dangerous waters. While Captain Beardslee held parley with the Indians in Berg bay, Ensign Hanus made a running survey of the lower end of the bay, the lines of its northern extension and indentations being drawn in roughly from the descriptions of the native seal-hunters. The Indians at the same time told of the two white men who had come the preceding year, and Captain Beardslee easily recognized Mr Muir from this description, the glacial prospector being well known on the coast. Mr Muir returned to the bay in September, 1880, and spent some weeks exploring the ice-fields. On his return that winter to San Francisco, he again wrote and lectured about the "Fairweather glaciers," the only designation he gave to these ice-streams.

Captain Beardslee described his visit in an official report (Forty-sixth Congress, Second Session, Senate Ex. Doc. No. 145), accompanied by his map of the bay, and also published an account in letters to *Forest and Stream*. By his own personal insistence and a determined stand made at the Coast Survey office, Captain Beardslee had his very apt name of Glacier bay retained on official charts, instead of giving to it the name of some inconsequent and now forgotten statesman whom it seemed officially desirable to flatter at the time. All Alaska tourists owe it to Captain Beardslee that this reserve of such unparalleled scenic grandeur is not vulgarized by some great misnomer.

Captain Beardslee gave a tracing of this chart and notes to Captain James Carroll, and Mr Muir assured that navigator that there was clear navigation beyond the Beardslee islands, and that if he followed the eastern shores he would find anchorage in a broad inlet into which one of the largest glaciers broke away. Captain Carroll took the steamship *Idaho* into the bay in July, 1883, found the inlet and glacier as described, and named them

both for Mr Muir. Captain William George, pilot of the *Idaho*, sent a sketch map and notes, with record of the names they had bestowed, to the Coast Survey. It was my good fortune to be one of the *Idaho's* passengers on that voyage, and a pleasure later to inform Mr Muir at his Martinez ranch that the great glacier had been named for him. "Which one of the glaciers do they



From "Alaska Guide Book," *Copyright, 1893, by D. Appleton & Co.*

call mine?" was his amused question and only reply. Mr Muir did not bestow any names in the course of his first ice explorations in Alaska.

The bay has not yet been surveyed and charted by the government, although the Pacific Coast Steamship Company's vessels have regularly visited it since 1883 and landed thousands

of enthusiastic passengers in Muir inlet. Through private enterprise the Muir glacier and all its tributaries have been explored and mapped, and the work of Professor Harry Fielding Reid and his assistants leaves nothing for the delinquent government to do in that quarter. Mr Muir canoed across the front of the Grand Pacific glacier and the shores of the bay's end in 1879; Professor Reid made a similar canoe cruise in 1892, and succeeding in it, accompanied Captain James Carroll, who took the large ocean steamer *Queen* around those upper reaches, found the unsuspected Johns Hopkins glacier, and, penetrating two deep inlets, discovered the hitherto unknown Rendu and Carroll glaciers, as then named by Professor Reid and published on the map accompanying Appleton's Guide to Alaska.

Mr Muir seems to be justly entitled to the honors as the discoverer of Glacier bay, since he first fulfilled the conditions of both finding and bringing its wonders to the knowledge of the world. Lieutenant Wood, as he himself says, did not surely know that the bay was waiting to be found; that it definitely needed a discoverer, and his scant geographic references in the *Century's* pages did not altogether bring it to the knowledge of the world or stimulate others to explore. He awards all the honor to Mr Muir. Lieutenant Wood was the Lief Ericsson, Mr Muir the Columbus, in this instance.

In five summer visits to Alaska, during one of which our party camped for several weeks in the cabin at the side of Muir glacier, I made every effort to learn of earlier visitors than Mr Muir and Lieutenant Wood and to meet those mythical miners who were said to have known the bay well for years before the great glacial geologist went there. The closest questioning of those residents making these statements resulted in vague and foggy generalities. "I guess so;" "I was told so;" "I supposed so." Not a fact, not a date, nor a definite statement, nor a particle of proof could be obtained from these free and easy talkers of steamer wharves on tourist days. The alleged miners had always "gone to the Yukon;" it was not known whether letters would reach them at Forty Mile creek or not; it was quite possible they had left the Yukon, etc. These ready dispensers of information did not know the full names or the real names of these miners; even "Slim Jim," of Juneau, could not help them there, but they were always sure that "a lot of miners" had prospected all around the bay at least one year before Mr Muir went there (1879), only, the miners never thought it worth while to say

anything "until these tourists began making such a fuss over the glaciers." Not one of them, however, had ever heard of Lieutenant Wood's visit in 1877, two years before Mr Muir and one year before the mythical miners.

HYDROGRAPHY IN THE UNITED STATES

By Frederick H. Newell,

Chief Hydrographer, United States Geological Survey

Hydrography has been defined as that branch of the science of physical geography which pertains to the waters of the earth's surface. The river systems, the annual regimen of the streams and their function in sculpturing the land, the lakes with their fluctuations, and the oceans with their tides and currents, all come within the province of the hydrographer. In the United States explorations and discoveries in this branch of geography are being made largely through surveys carried on by the Federal Government through its various executive departments—as, for instance, the Coast and Geodetic Survey, a bureau of the Treasury Department; the Geological Survey, a part of the Department of the Interior, and others. In common use, especially among mariners, the term hydrography is understood as pertaining only to marine surveying and charting, but as employed in scientific usage it embraces far more than the knowledge of the coasts and includes all waters, without reference to navigation, thus covering the continents as well as the oceans.

In tracing the order in which these hydrographic surveys are being made by the various organizations or bureaus of the government, it may be well to begin with the waters as they first occur upon the land and trace them downward in their course to the ocean. First in this system comes the Weather Bureau, which measures and records the precipitation at various places. From these data certain general deductions can be made regarding the hydrography of the country, but the operations pertaining more directly to this subject are those incident to the prediction of floods along important streams. For this purpose the Weather Bureau maintains river gauges at various points, the observers reporting the height of water at certain intervals, and at times of threatened floods telegraphing the facts regarding the behavior

of the stream, in order that the central office of the district or that at Washington may be informed in time to issue predictions or warnings as to impending disaster. The operations of this bureau, as far as they relate to the hydrography of the rivers and of the lake and seacoast navigation, are for the exclusive purpose of issuing prompt notices, which shall be of immediate value to the farmer or other resident upon the lowlands and to the sailor.

Coming next in the scheme of the study of the waters of the country is the work of the Geological Survey, which, taking the facts relating to precipitation and moisture given by the Weather Bureau and utilizing the data as to river heights as far as possible, expands these into a general study of the occurrence of water within the United States, tracing out the causes, especially those of topographic and geologic character, which lead to variations in distribution and fluctuations in supply, and in short bringing together material by which the water resources of the country may be known as thoroughly as its mineral wealth. From the time, therefore, that the rain reaches the ground the Geological Survey endeavors to trace its course on or below the surface and to ascertain the laws governing its circulation and its reappearance by seepage or through natural outlets in springs or in artificial openings, such as artesian or other wells.

This Survey, as incidental to the preparation of the great map of the United States, examines in detail the surface of the country, determines the age and character of the rocks, their structure and position with relation to each other, their permeability or imperviousness to water, and the probabilities of their being able to yield a supply at points not yet penetrated by the well-digger. As in all scientific work, the ultimate object is that of prediction, of revealing that which is now unknown or but partly understood. Such extension of knowledge rests upon a thorough examination and understanding of the history of the past and of the conditions in the present. Before questions can be answered as to what is the probable supply of water at this or that point, for power, for irrigation, or for municipal supply, it is necessary that long-continued and accurate work be done.

The work of the United States Geological Survey relating to water resources is carried on by the Division of Hydrography. The field operations of this division consist of the measurement at selected points of the flowing waters of springs, creeks, and rivers, the estimation of the discharge of artesian wells, and of the quantities of water which can be obtained by other means.

Permanent river stations are established at many points on important streams, usually near their headwaters, and daily records kept of the fluctuations. These fluctuations are in turn interpreted into quantities of discharge by means of measurements of area and velocity made at short intervals by the hydrographers. The quantities thus ascertained furnish the basis for comparisons day by day, month by month, and year by year, throwing light upon the relation between precipitation and discharge, and upon the modifying influences introduced by topography, geologic structure, and cultural conditions. The non-periodic fluctuation of waters, the questions of erosion, transportation, and sedimentation, the appearance and disappearance of surface streams and the minerals in solution are all matters connected more or less directly with this study of stream behavior.

The surveys of the surface streams, their slope as obtained by the topographers, their volume as measured by the hydrographers, and their composition as determined by the chemist, are, however, simple matters in comparison with those which relate to the waters immediately beneath the surface. In the first case the phenomena are visible and tangible; in the second, keen observation must be followed by correct reasoning from well-established facts and conclusions. The occurrence of underground water in quantities sufficient to be of value, its character as regards mineral contents, and the pressure under the influence of which it may rise toward the surface, are all details which vary with the geology of the particular area. To be able to predict that water can be found at a given place, at a certain depth, and in quantity, it is necessary to know thoroughly all the facts which can be ascertained concerning the geology of the region. Toward this end the Geological Survey is collecting and putting upon record all obtainable data concerning deep wells, whether successful or not, and is making examinations of the water-bearing rocks wherever they come to the surface or are penetrated by underground workings. In the course of the preparation of the systematic sheets, designed ultimately to cover the whole country, much of this work has been done, but in certain portions of the country, such as the subhumid, where information is needed in advance of the completion of these atlas sheets, the field examinations of the hydrographic division are being pushed forward for this one object. The investigations of this division are thus seen to touch very closely the work of the Weather Bureau in its records of precipitation and in its material for flood prediction,

and to connect these intimately with the mapping of the topographer and the studies of the geologist.

Passing from the many small streams of the country to the larger, navigable rivers, the work of the Engineer Corps of the Army is reached. As far as this relates to hydrography, the surveys of the Engineer Corps consist of examinations of particular points with the object of obtaining information preliminary to construction for the benefit of navigation. A considerable number of river gauges have been maintained and readings continued in order to ascertain the periods of low and high water and to obtain other data essential to correct plans. A few measurements of volume have been made upon some of the larger streams. With the work of the Engineer Corps can be placed that of the Mississippi and Missouri River Commissions, these organizations having conducted series of observations throwing light upon the behavior of these great rivers. Nearly related to this has been the work of the Lake Survey, conducted by army engineers, who have prepared detailed maps of the shores, showing the harbors, passages, and depths of water at all the shallow places.

At the head of tide water begins the work of the United States Coast and Geodetic Survey. This, the oldest of the surveying organizations of the Government, maps the navigable tidal waters of the United States from the remotest waters to the shore line and from the shore line outward to the oceanic abyss, studying the currents and fluctuations of water surface and mapping in great detail the harbors, shoals, channels, and all other features of importance to mariners. The investigations of this Survey have been conducted with the utmost accuracy, and its charts and publications relating to hydrography have reached the highest point of scientific attainment. With the work of the Coast Survey may be considered that of the Light-house Board, also a bureau of the Treasury Department, which in a relatively more limited and less detailed way has made hydrographic surveys for the purpose of erecting danger signals or light-houses, and has thus contributed somewhat to the knowledge of the navigable waters.

Extending beyond the bounds of the United States, our knowledge of the hydrography of the great seas is being added to by the Hydrographic Office of the Navy, which brings together and publishes maps, charts, and everything of interest to mariners relating to foreign lands, and covering with perhaps less minuteness the shores of other countries in a manner similar to that

with which the Coast Survey has mapped out the waters of the United States.

Historically the investigations set on foot by the Smithsonian Institution should be noticed, for from these has come, directly or indirectly, nearly all our information concerning hydrography in its broader aspect. The systematic study of precipitation was first begun under this institution, and after being well established was turned over to the Signal Office, the predecessor of the Weather Bureau. In other lines the Smithsonian Institution has in similar manner shown the way, and when feasible has entrusted the continuation of the investigations to other organizations, in order that it might concentrate its own energies on other original lines of research tending to "the increase and diffusion of knowledge."

RECENT TRIANGULATION IN THE CASCADES

By S. S. Gannett,

United States Geological Survey

During the field season of 1895, the United States Geological Survey extended triangulation over a portion of central Washington. An astronomical determination of Ellensburg having been made, a base was measured on the roadbed of the Northern Pacific railroad. From this base, triangulation was extended into the Cascade mountains. Horizontal angles were measured with an eight-inch theodolite, reading by micrometers to two seconds of arc. Vertical measures were also taken upon some of the more prominent peaks, angles being measured by a vertical circle four and one-half inches in diameter and reading by vernier to one minute of arc. Elevations are based upon the height of the Northern Pacific railroad at Ellensburg.

The preliminary computation gives the elevation of mount Aix, by reciprocal observations to and from stations in the base expansion, 28 miles distant, as 7,815 feet above sea level.

Mount Rainier, by foresights from mount Aix, 24 miles distant, is found to be 14,532 feet, mount Adams, likewise by foresights from mount Aix, 42 miles distant, 12,470 feet, and mount Stuart, by foresights from several stations in the base expansion 24 to 30 miles distant, 9,500 feet, above sea level.

THE ALTITUDE OF MOUNT ADAMS, WASHINGTON

By EDGAR MCCLURE

On July 10, 1895, in company with the heliograph party of the Mazamas,* I carried a mercurial barometer to the summit of mount Adams, a snow-capped peak in the Cascade range, in the southern part of the state of Washington.

We traveled from Eugene, Oregon, by rail to Portland, Oregon; thence by steamer down the Willamette river to its mouth, and thence up the Columbia river to White Salmon landing. From this last-mentioned point we traveled north by wagon road 27 miles to Trout lake, and thence by trail, still northward, 14 miles to the snow-line on the mountain side. This camp was called Mountain View camp, and is situated near the foot of the White Salmon glacier. From this point it is a continuous climb of four miles to the summit of the mountain.

The instrument used was barometer No. 1612, made by James Green, of Brooklyn, New York. It was compared with the Weather Bureau instrument at Portland, Oregon, and with the large standard barometer belonging to the State Weather Service at the University of Oregon, at Eugene, Oregon. Parallel observations were made by previous arrangement at Portland, Oregon, Eugene, Oregon, and Seattle, Washington.

Mountain View camp, at the snow-line, was left at 4:30 a. m. on July 10, and the summit of the mountain was reached about 11:00 a. m. The ascent was made over a large snow-field immediately west of a long lava ridge which runs southeastward from the summit of the mountain. The climb is long and hard, but it has no points of danger along the route. The summit was left for the return trip about 4:00 p. m. and camp was reached about 5:30 p. m.

Observations began on the summit at 12:30 p. m. and were continued until 3:30 p. m. The air thermometer having been accidentally broken on the evening before the climb, the air temperature on the summit was taken from the attached ther-

* The Mazamas is an association of mountain climbers, with headquarters at Portland, Oregon. The object of the organization is the collection of scientific data concerning the mountains of Oregon and Washington.

mometer by subtracting three degrees. Parallel readings, taken at Trout lake and Mountain View camp, of the attached thermometer and the air thermometer, before the latter was broken, gave readings of the latter 2° and 3° below the former. The belief that the reading on the summit of the mountain on the afternoon of the climb would have been in the same proportion is strengthened by the fact that the air temperature shown by the air thermometer used with the boiling-point apparatus closely corresponded with my air temperature obtained in the manner above stated.

OBSERVATIONS.

Portland, Oregon.

State Weather Bureau, July 10, 1895.

P. M.	*Barograph.*	*Thermograph.*
1:00	29.80	90 F.
2:00	29.79	92 "
3:00	29.77	93 "

Pressure figures corrected for temperature. Barometer 157 feet above sea level.

B. S. PAYNE,
Director.

Seattle, Washington.

Weather Bureau, July 10, 1895.

P. M.	*Barograph.*	*Thermograph.*
1:00	29.875	85 F.
2:00	29.865	86 "
3:00	29.850	87 "

Pressure figures corrected for temperature. Barometer 119.4 feet above sea level.

GEORGE N. SALISBURY,
Observer.

Eugene, Oregon.

University of Oregon, July 10, 1895.

P. M.	*Standard barometer.*	*Exp. thermometer.*
1:00	29.386	93.5
2:00	29.374	94.0
3:00	29.361	95.0

Pressure figures corrected for temperature. Barometer 485.7 feet above sea level.

S. H. MCALISTER,
Observer.

Summit of Mount Adams, Washington.

Mazama Expedition, July 10, 1895.

P. M.	*Barometer No. 1612.*	*Air temperature.*
1:00	19.256	38.0
2:00	19.272	38.5
3:00	19.281	43.0

Pressure figures corrected for temperature. Cistern of barometer 1.1 feet above the level of snow.

The calculations were made by two methods—by Major R. S. Williamson's tables, based on Plantamour's formula, and by Guyot's tables. In the former case, since no observations were taken to determine the humidity of the air, the temperature correction was calculated by the formula of La Place. Three estimates were made on each place as a base from observations taken at 1:00, 2:00, and 3:00 o'clock p. m. This gives nine estimates

by each method, or a total of eighteen estimates on the elevation of the peak. The two results agree within 44.7 feet.

	P. M.	Williamson.		Guyot.	
Portland, Oregon	1:00	12,459.8		12,413.5	
	2:00	12,457.7		12,412.4	
	3:00	12,495.3		12,449.8	
Mean			12,470.9		12,425.2
Seattle, Washington	1:00	12,427.8		12,382.6	
	2:00	12,414.4		12,369.2	
	3:00	12,458.1		12,411.8	
Mean			12,433.4		12,387.9
Eugene, Oregon	1:00	12,436.6		12,393.8	
	2:00	12,414.0		12,371.1	
	3:00	12,455.7		12,412.6	
Mean			12,435.4		12,392.5
Grand mean			12,446.6		12,401.9

The mean of these two estimates, 12,446.6 and 12,401.9, is 12,424.2.

Trout Lake and Mountain View Camp.—An estimate based on observations made before the climb gives the following elevations:

Trout lake (camp at Wagnitz place)..... 1,854 feet.
Mountain View camp (snow line, July 10, 1895)..... 5,714 feet.

GEOGRAPHIC LITERATURE

Archeological Studies among the Ancient Cities of Mexico. Part I: Monuments of Yucatan. By William H. Holmes. Pp. 137, with 18 plates. Chicago, 1895.

This is the eighth publication of the Field Columbian Museum and the first of the Anthropological series. It opens with an itinerary of the voyage of the yacht *Ituna* (the property of Mr Allison V. Armour), which sailed from New York December 16, 1894, and reached the coast of Yucatan a fortnight later, carrying a scientific party headed by Professor Holmes; and thereafter, for two months, the services of the vessel and the energies of the party were devoted to researches in the land of ancient cities. Ever since the conquest Yucatan has been noted for ruins of astonishing magnificence, and the names of the ancient cities, Palenque and Chichen-Itza and Uxmal, are hardly less known than those of present population centers. Stephens, Maudslay, Bandelier, Charnay, and other archeologists have drawn on the rich store of records of ancient culture afforded by these cities, and the Le Plongeons, husband and wife, have made voluminous collections and evolved curious speculations amid the ruins; and now a well-known archeologist and artist has traversed this singu-

larly fertile field, and, with the aid of camera and pencil, has reproduced some of the most striking features of the ancient work. The photographs are excellent and remarkably well reproduced; the author's device of representing the ruins in panoramas, with the mantle of vegetation omitted, is quite effective, and the wealth of detail depicted in the minor drawings adds much to the value of the book. In this treatise and the succeeding part, which is promised soon to follow, a clear and faithful picture of the Yucatec ruins will be found; and the great Museum at Chicago is to be felicitated as the patron of the research and the depository of the collections growing out of it.

Geological History of the Chautauqua Grape Belt. Bulletin No. 109, Cornell University Agricultural Experiment Station, Ithaca, N. Y. By R. S. Tarr. Pp. 36, with maps and illustrations.

This is issued as the first specific attempt in this country on the part of an experiment station to analyze the physical geography of a fruit belt. Notwithstanding most excellent opportunities, very little has been attempted in the United States in the way of studying the conditions of soil and climate existing in what may be called type fruit regions. It is obvious that such studies, if properly carried on, would be of great practical value, for if once the conditions prevailing in the type regions for certain fruits were thoroughly understood it would be possible within given limits to determine the practicability of growing such fruits in other sections of the country. Work bearing on this subject has for several years been in progress by Professor Milton Whitney, of the United States Department of Agriculture, and as a result the geological and physical characteristics of the type soils for several important crops have been worked out. The work by Professor Tarr, although somewhat different in its character, has the same object in view, namely, that of ascertaining the natural conditions existing in a region famous for the excellence of one of its products, in this instance the grape. Professor Tarr has confined his studies largely to the geological side of the question, first discussing the topography and then following with a consideration of the bed rock. The different kinds of soils and their relative values are also discussed. Altogether the bulletin is very interesting, and is especially valuable as taking up a line of work that has been somewhat neglected.

Die Liparischen Inseln. In eight Parts, fully illustrated with excellent wood cuts of Sketches by Fredrich Hawránek. Prag. Heinr. Mercy, 1895.

This handsome work gives a complete picture of the present condition of these interesting historical islands and contains much information of value to the student and traveler. Each of the first seven parts is devoted to an elaborate illustration of one of the islands, with a brief description of its natural features and culture. One cannot but regret that the numerous illustrations of these remarkable volcanic islands are drawn wholly from sketches instead of from photographs, which have so much higher a value as a source of information. For example, in part 5, chapter III, the illustrations of the cavernous coast show no definite relation of the caverns and arches to the structure of the rock, as is well known to

be the case along coasts of volcanic rocks. An excellent hachure-shaded contour map is given of each island, on a scale in some cases as large as 1 : 25000. The eighth part contains, besides a map of the whole group, brief descriptions of the climate, sea, anchorage, springs, flora, fauna, and population of the islands, as well as fuller accounts of the occupations of the people, their habits, customs, and commerce, with their means of intercommunication and accommodations for tourists.

PROCEEDINGS OF THE NATIONAL GEOGRAPHIC SOCIETY, SESSION 1895-'96

Special Meeting, February 28, 1896.—Vice-President Greely in the chair. Mrs Fannie B. Ward read a narrative of Two Years' Travel in and about South America, illustrated by lantern-slides, mostly from original drawings and photographs.

Special Meeting, March 2, 1896.—First lecture of the course of seven illustrated Monday afternoon lectures descriptive of a trip to Alaska. President Hubbard in the chair. Mr W J McGee described the route from St. Paul, Minnesota, to Banff, Alberta, and Mr Bailey Willis an excursion to Mount Rainier, Washington. Both addresses were illustrated by lantern-slides.

Regular Meeting, March 6, 1896.—Vice-President Merriam in the chair. Mr F. V. Coville read a paper, illustrated by lantern-slides, on the Adaptations of Plants to Desert Environment. The paper was discussed by Mr W J McGee, Surgeon-General George M. Sternberg, U. S. A., Mr G. K. Gilbert, Dr C. Hart Merriam, and others.

Special Meeting, March 9, 1896.—Second Monday afternoon lecture. President Hubbard in the chair. Prof. Charles E. Fay, of Tufts College, Massachusetts, delivered an address on the Glaciers, Peaks, and Canyons of the Canadian Rockies, illustrated by lantern-slides.

Special Meeting, March 12, 1896.—Reception at the Arlington Hotel to the Venezuelan Boundary Commission. President Hubbard and a committee of ladies, headed by Mrs Richard Olney, received the Society's guests and presented to them upwards of 400 of the members of the Society and their friends.

Special Meeting, March 13, 1896.—President Hubbard in the chair. Mr C. E. Borchgrevink, of Norway, addressed the Society, giving a graphic description of his voyage to the Antarctic continent, and exhibiting a number of lantern-slide reproductions of photographs.

Special Meeting, March 16, 1896.—Third Monday afternoon lecture. President Hubbard in the chair. Mr James Fletcher, of Ottawa, Canada, described the trip from the Canadian National Park to the Pacific Coast, illustrating his address by means of lantern-slides and specimens of the flora and fauna of the region traversed.

Regular Meeting, March 20, 1896.—Vice-President Gannett in the chair. Mr N. H. Darton read a paper, illustrated by lantern-slides, on the Physiographic Development of the District of Columbia Region. He was followed by Major Gilbert Thompson, who spoke on the Use of Geodetic Control Lines in Geographic Work.

Special Meeting, March 23, 1896.—Fourth Monday afternoon lecture. President Hubbard in the chair. Lieut. A. P. Niblack, U. S. N., described the trip, "From Puget Sound to Sitka; Fiords, Islands, and Canals," with lantern-slide illustrations.

Elections.—New members have been elected as follows:

February 28.—Rev. Dr Alfred H. Ames, Edward Burgess, Prof. J. A. I. Cassedy, Rev. Ernst Drewitz, D. Wallace Duncan, O. J. Edwards, Miss Mary H. Elliott, James Fletcher, A. B. de Guerville, Dr Herbert Harlan, Chr. Heurich, Dr A. L. Howard, W. J. Lampton, Edmond S. Meany, Daniel Murray, Rev. Jos. B. North, Walter T. Paine, Col. Henry A. Pierce, Wm. H. Saunders, H. Jaudon Smith, Chas. C. Snow, Chas. M. Staley, W. P. Van Wickle, Wm. G. Webster, S. T. White, John W. Winder, Dr D. P. Wolhaupter, F. G. Würdemann.

March 20.—Perry Allen, Judge Victor Barringer, Miss Marie E. Byington, Henry A. Curtis, James A. Edgar, Dr R. Farnham, Henry F. Getz, Francis R. Hart, Mrs A. G. Hensley, Marshall H. Jewell, Prof. L. M. Keasbey, Chief Engineer Absalom Kirby, U. S. N., F. R. McCormick, Lieut. A. P. Niblack, U. S. N., Miss M. L. Nicholson, Frederick Law Olmsted, Jr., Leopoldo S. Pietra, D. M. Quackenbush, C. C. Randolph, W. L. Symons, Hon. G. P. Wetmore, U. S. S., Wm. Whelan, W. D. Wilcox.

MISCELLANEA

The Congress of Chambers of Commerce at Bloemfontein, South Africa, has resolved to adhere to meridian 22° 30′ east as the standard time for South Africa.

The total output of gold in the seven Australasian colonies in 1895 is officially announced as 2,350,562 ounces, an increase of 106,928 ounces over the production in 1894.

The salmon pack of the Columbia river last year amounted to 655,410 cases, of the aggregate value of $3,342,928. The industry gave employment to 3,775 fishermen and to 1,574 cannery operatives.

The population of the city of Melbourne at the end of 1895 is officially reported as 447,461, an increase during the year of 8,506. The estimated population of the seven Australasian colonies at the end of 1895 was 4,238,000, an increase of 11.25 per cent since the census of 1891.

Upwards of 100,000 bales of American and Egyptian cotton have been received at Manchester, via the ship canal, since September last. There has also been a very large increase in the receipts of lumber and other raw products, and much concern is again being felt in Liverpool as to the probable effect of this great enterprise upon the commerce of that city.

XUM

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The travel into Mexico annually becomes larger as people come to realize the novelty of the delightful journey and the ease and cheapness with which it can be made via the Southern Pacific and connecting lines in Mexico. At Spofford Junction the Northern and Eastern tourist, who has presumably taken the Southern Pacific at New Orleans because of its quick and direct service and splendid equipment, finds his sleeper switched from the main line, and a waiting train speedily takes him to Eagle Pass and the Rio Grande. His car goes direct to the City of Mexico via the Mexican International and Mexican Central Railways, and the way leads through some of the most beautiful and inspiring scenery in the world. The whole native life is so quaint and so at variance with all preconceived ideas—so different from anything one sees in the United States—that the tourist is in a constant tremor of excitement and finds himself continually edified and interested. The life of the cities is no less unique than is that of the rural district. Making the City of Mexico a center, a great many points may be profitably visited—from the snow-clad summits of the great mountains to the lowlands where the coffee and banana plantations sweep to the seacoast. For additional information call on or write to S. F. B. Morse, General Passenger Agent, Southern Pacific, New Orleans, La.

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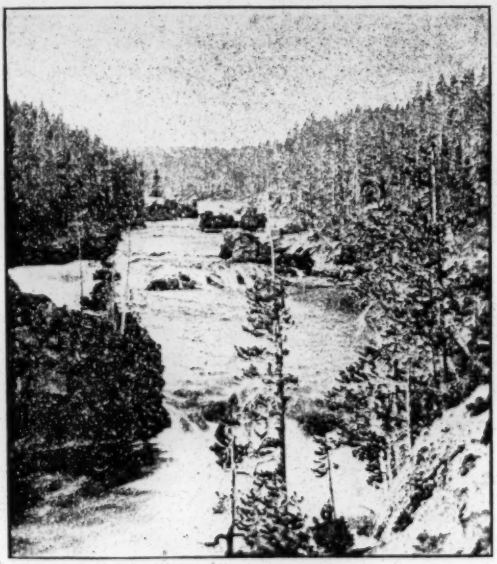

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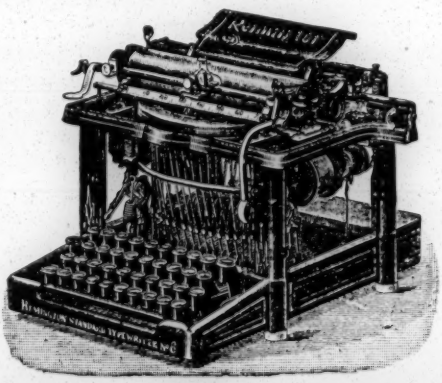

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